

**WHAT IS CLAIMED IS:**

1. A viscoelastic fluid comprising:

- (1) an aqueous medium;
- (2) a zwitterionic surfactant; and
- (3) a member selected from the group consisting of organic acids, organic acid salts, inorganic salts, and combinations of one or more organic acids or organic acid salts with one or more inorganic salts;

wherein the zwitterionic surfactant constitutes 77% or more by weight of all surfactants present in the fluid;

wherein the fluid exhibits the property of viscoelasticity.

2. The fluid as claimed in claim 1 wherein the amount of the zwitterionic surfactant is present at about 0.5% to about 10% by weight of the fluid.

3. The fluid as claimed in claim 1 wherein the amount of the zwitterionic surfactant is present at about 0.5% to about 8% by weight of the fluid.

4. The fluid as claimed in claim 1 wherein the amount of the zwitterionic surfactant is present at about 0.5% to about 6% by weight of the fluid.

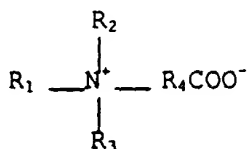
5. The fluid of claim 1 wherein the zwitterionic surfactant constitutes 89% or more by weight of all surfactants present in the fluid.

6. The fluid of claim 1 wherein the zwitterionic surfactant constitutes 92% or more by weight of all surfactants present in the fluid.

7. The fluid of claim 1 further comprising an anionic surfactant, the anionic surfactant being present at 1.2% or less by weight of the fluid.

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8. The fluid of claim 7 wherein the anionic surfactant is present at 0.9% or less by weight of the fluid.
9. The fluid of claim 7 wherein the anionic surfactant is present at about 0.5% or less by weight of the fluid.
10. The fluid as claimed in claim 1 wherein the zwitterionic surfactant has a quaternary ammonium hydrophilic moiety.
11. The fluid as claimed in claim 1 wherein the surfactant has a carboxylate hydrophilic moiety.
12. The fluid as claimed in claim 1 wherein the member is an inorganic salt and is present at about 0.1% to about 30% by weight.
13. The fluid as claimed in claim 1 wherein the member is an organic acid or salt thereof and is present at about 0.1% to about 10% by weight.
14. The fluid as in claim 1 wherein the surfactant is represented by the formula (I):



wherein R<sub>1</sub> represents alkyl, alkenyl, alkylarylalkylene, alkenylarylalkylene, alkylaminoalkylene, alkenylaminoalkylene, alkylamidoalkylene, or alkenylamidoalkylene, wherein each of the-alkyl groups have from about 14 to about 24 carbon atoms and may be branched or straight chained and saturated or unsaturated, and wherein the alkylene groups have from about 1 to about 6 carbon atoms, R<sub>2</sub> and R<sub>3</sub> are independently aliphatic chains having from about 1 to about 30 carbon atoms, and R<sub>4</sub> is a hydrocarbyl radical with a chain length of about 1 to about 4.

15. The fluid of claim 14 wherein R<sub>1</sub> is selected from the group consisting of tetradecyl, hexadecyl,

octadecenyl, and octadecyl.

16. The fluid of claim 15 wherein  $R_1$  is an alkyl group derived from tallow, coco, soya bean, or rapeseed oil.

17. The fluid of claim 14 wherein the alkyl and alkenyl groups of  $R_1$  are selected from alkyl groups and alkenyl groups respectively having from about 16 to about 22 carbon atoms.

18. The fluid of claim 14 wherein  $R_2$  and  $R_3$  are independently alkyl, alkenyl, arylalkyl, hydroxyalkyl, carboxyalkyl, or hydroxyalkylpolyoxyalkylene, each having about 1 to about 10 carbon atoms.

19. The fluid of claim 14 wherein  $R_2$  and  $R_3$  are independently methyl, ethyl, benzyl, hydroxyethyl, hydroxypropyl, carboxymethyl, or carboxyethyl.

20. The fluid of claim 14 wherein  $R_4$  is methylene or ethylene.

21. The fluid of claim 14 wherein  $R_2$  and  $R_3$  are each beta-hydroxyethyl.

22. The fluid of claim 21 wherein  $R_1$  is  $RCONHCH_2CH_2CH_2-$  wherein R is an alkyl group having from about 14 to about 24 carbon atoms which may be branched or straight chained and which may be saturated or unsaturated.

23. The fluid of claim 14 wherein  $R_2$  and  $R_3$  are each methyl.

24. The fluid of claim 23 wherein  $R_1$  is  $RCONHCH_2CH_2CH_2-$  wherein R is an alkyl group having from about 14 to about 24 carbon atoms which may be branched or straight chained and which may be saturated or unsaturated.

25. The fluid of claim 14 wherein the zwitterionic surfactant is selected from the group consisting of

dihydroxyethyl glycinate and alkylamidopropyl betaines.

26. The fluid of claim 25 wherein the zwitterionic surfactant is oleamidopropyl betaine.

27. The fluid of claim 14 wherein the zwitterionic surfactant is present at from about 0.5% to about 6% by weight in the fluid.

28. The fluid of claim 27 further comprising an anionic surfactant, the anionic surfactant being present at 1.2% or less by weight of the fluid.

29. The fluid of claim 28 wherein the anionic surfactant is present at 0.9% or less by weight of the fluid, the zwitterionic surfactant being present at 89% or more by weight of the fluid.

30. The fluid of claim 25 wherein the zwitterionic surfactant is present at from about 0.5% to about 6% by weight in the fluid, the fluid further comprising an anionic surfactant, the anionic surfactant being present at 1.2% or less by weight of the fluid.

31. A viscoelastic fluid comprising:

(1) an aqueous medium;

(2) a zwitterionic surfactant; and

(3) a member selected from the group consisting of organic acids, organic acid salts, inorganic salts, and combinations of one or more organic acids or organic acid salts with one or more inorganic salts;

(4) an anionic surfactant, wherein the ratio of zwitterionic surfactant to anionic surfactant is 3/1 or greater;

wherein the fluid exhibits the property of viscoelasticity.

32. The fluid as claimed in claim 31 wherein the amount of the zwitterionic surfactant is from about 0.5% to about 10% by weight of the fluid.

33. The fluid as claimed in claim 31 wherein the amount of the zwitterionic surfactant is from about 0.5% to about 8% by weight of the fluid.

34. The fluid as claimed in claim 31 wherein the amount of the zwitterionic surfactant is from about 0.5% to about 6% by weight of the fluid.

35. The fluid of claim 31 wherein the ratio of zwitterionic surfactant to anionic surfactant is greater than 5 to 1.

36. The fluid of claim 31 wherein the ratio of zwitterionic surfactant to anionic surfactant is 8 to 1 or greater.

37. The fluid of claim 31 wherein the ratio of zwitterionic surfactant to anionic surfactant is 12 to 1 or greater.

38. The fluid as claimed in claim 31 wherein the zwitterionic surfactant has a quaternary ammonium hydrophilic moiety.

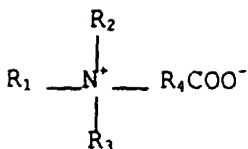
39. The fluid as claimed in claim 31 wherein the surfactant has a carboxylate hydrophilic moiety.

40. The fluid as claimed in claim 31 wherein the member is an inorganic salt and is present in an amount of from about 0.1% to about 30% by weight.

41. The fluid as claimed in claim 31 wherein the member is an organic acid or salt thereof and is present in an amount of from about 0.1% to about 10% by weight.

42. The fluid as in claim 31 wherein the surfactant is represented by the

formula (I):



wherein R<sub>1</sub> represents alkyl, alkenyl, alkylarylalkylene, alkenylarylalkylene, alkylaminoalkylene, alkenylaminoalkylene, alkylamidoalkylene, or alkenylamidoalkylene, wherein each of the alkyl groups have from about 14 to about 24 carbon atoms and may be branched or straight chained and saturated or unsaturated, and wherein the alkylene groups have from about 1 to about 6 carbon atoms,

R<sub>2</sub> and R<sub>3</sub> are independently aliphatic chains having from about 1 to about 30 carbon atoms, and

R<sub>4</sub> is a hydrocarbonyl radical with a chain length of about 1 to about 4.

43. The fluid of claim 42 wherein R<sub>1</sub> is selected from the group consisting of tetradecyl, hexadecyl, octadecenyl, and octadecyl.

44. The fluid of claim 42 wherein R<sub>1</sub> is an alkyl group derived from tallow, coco, soya bean, or rapeseed oil.

45. The fluid of claim 42 wherein the alkyl and alkenyl groups of R<sub>1</sub> are selected from alkyl groups and alkenyl groups respectively having from about 16 to about 22 carbon atoms.

46. The fluid of claim 42 wherein R<sub>2</sub> and R<sub>3</sub> are independently alkyl, alkenyl, arylalkyl, hydroxyalkyl, carboxyalkyl, or hydroxyalkylpolyoxyalkylene, each having about 1 to about 10 carbon atoms.

47. The fluid of claim 42 wherein R<sub>2</sub> and R<sub>3</sub> are independently methyl, ethyl, benzyl, hydroxyethyl, hydroxypropyl, carboxymethyl, or carboxyethyl.

48. The fluid of claim 42 wherein R<sub>4</sub> is methylene or ethylene

49. The fluid of claim 42 wherein  $R_2$  and  $R_3$  are each beta-hydroxyethyl.

50. The fluid of claim 49 wherein  $R_1$  is  $RCONHCH_2CH_2CH_2-$  wherein R is an alkyl group having from about 14 to about 24 carbon atoms which may be branched or straight chained and which may be saturated or unsaturated.

51. The fluid of claim 42 wherein  $R_2$  and  $R_3$  are each methyl.

52. The fluid of claim 51 wherein  $R_1$  is  $RCONHCH_2CH_2CH_2-$  wherein R is an alkyl group having from about 14 to about 24 carbon atoms which may be branched or straight chained and which may be saturated or unsaturated.

53. The fluid of claim 42 wherein the zwitterionic surfactant is selected from the group consisting of dihydroxyethyl glycinate and alkylamidopropyl betaines.

54. The fluid of claim 53 wherein the zwitterionic surfactant is oleamidopropyl betaine.

55. The fluid of claim 42 wherein the zwitterionic surfactant is present at about 0.5% to about 6.0% by weight of the fluid.

56. The fluid of claim 55 wherein the ratio of zwitterionic surfactant to anionic surfactant is greater than 5 to 1.

57. The fluid of claim 56 wherein the anionic surfactant is present at 1.2% or less by weight of the fluid.

58. The fluid of claim 57 wherein the anionic surfactant is present at 0.9% or less by weight of the fluid.

59. The fluid of claim 53 wherein the zwitterionic surfactant is present at about 0.5% to about 6.0%

by weight of the fluid.

60. The fluid of claim 59 wherein the ratio of zwitterionic surfactant to anionic surfactant is greater than 5 to 1.

61. The fluid of claim 60 wherein the anionic surfactant is present at 1.2% or less by weight of the fluid.

62. The fluid of claim 61 wherein the anionic surfactant is present at 0.9% or less by weight of the fluid.

63. A viscoelastic fluid comprising:

(1) an aqueous medium;  
(2) a zwitterionic surfactant; and  
(3) a member selected from the group consisting of organic acids, organic acid salts, inorganic salts, and combinations of one or more organic acids or organic acid salts with one or more inorganic salts; and

(4) an anionic surfactant, wherein the anionic surfactant is present at 1.2% or less by weight of the fluid;

wherein the fluid exhibits the property of viscoelasticity.

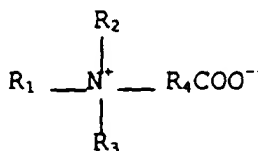
64. The fluid as claimed in claim 63 wherein the amount of the zwitterionic surfactant is from about 0.5% to about 10% by weight of the fluid.

65. The fluid as claimed in claim 63 wherein the amount of the zwitterionic surfactant is from about 0.5% to about 8% by weight of the fluid.

66. The fluid as claimed in claim 63 wherein the amount of the zwitterionic surfactant is from about 0.5% to about 6% by weight of the fluid.



67. The fluid of claim 63 wherein the anionic surfactant is present at 0.9% or less by weight of the fluid.
68. The fluid of claim 63 wherein the anionic surfactant is present at about 0.5% or less by weight of the fluid.
69. The fluid as claimed in claim 63 wherein the zwitterionic surfactant has a quaternary ammonium hydrophilic moiety.
70. The fluid as claimed in claim 63 wherein the surfactant has a carboxylate hydrophilic moiety.
71. The fluid as claimed in claim 63 wherein the member is an inorganic salt and is present in an amount of from about 0.1% to about 30% by weight.
72. The fluid as claimed in claim 63 wherein the member is an organic acid or salt thereof and is present in an amount of from about 0.1% to about 10% by weight.
73. The fluid as in claim 63 wherein the surfactant is represented by the formula (I)



wherein  $R_1$  represents alkyl, alkenyl, alkylarylalkylene, alkenylarylalkylene, alkylaminoalkylene, alkenylaminoalkylene, alkylamidoalkylene, or alkenylamidoalkylene, wherein each of the alkyl groups have from about 14 to about 24 carbon atoms and may be branched or straight chained and saturated or unsaturated, and wherein the alkylene groups have from about 1 to about 6 carbon atoms,

$R_2$  and  $R_3$  are independently aliphatic chains having from about 1 to about 30 carbon atoms, and  $R_4$  is a hydrocarbyl radical with a chain length of about 1 to about 4.

74. The fluid of claim 73 wherein  $R_1$  is selected from the group consisting of tetradecyl, hexadecyl,

octadecenyl, and octadecyl.

75. The fluid of claim 73 wherein  $R_1$  is an alkyl group derived from tallow, coco, soya bean, or rapeseed oil.

76. The fluid of claim 73 wherein the alkyl and alkenyl groups of  $R_1$  are selected from alkyl groups and alkenyl groups respectively having from about 16 to about 22 carbon atoms.

77. The fluid of claim 73 wherein  $R_2$  and  $R_3$  are independently alkyl, alkenyl, arylalkyl, hydroxyalkyl, carboxyalkyl, or hydroxyalkylpolyoxyalkylene, each having about 1 to about 10 carbon atoms.

78. The fluid of claim 73 wherein  $R_2$  and  $R_3$  are independently methyl, ethyl, benzyl, hydroxyethyl, hydroxypropyl, carboxymethyl, or carboxyethyl.

79. The fluid of claim 73 wherein  $R_4$  is methylene or ethylene.

80. The fluid of claim 73 wherein  $R_2$  and  $R_3$  are each beta-hydroxyethyl.

81. The fluid of claim 80 wherein  $R_1$  is  $RCONHCH_2CH_2CH_2-$  wherein R is an alkyl group having from about 14 to about 24 carbon atoms which may be branched or straight chained and which may be saturated or unsaturated.

82. The fluid of claim 81 wherein  $R_2$  and  $R_3$  are each methyl.

83. The fluid of claim 82 wherein  $R_1$  is  $RCQNHCH_2CH_2CH_2-$  wherein R is an alkyl group having from about 14 to about 24 carbon atom which may be branched or straight chained and which may be saturated or unsaturated.

84. The fluid of claim 63 wherein the zwitterionic surfactant is selected from the group consisting of

dihydroxyethyl glycinate and alkylamidopropyl betaines.

85. The fluid of claim 84 wherein the zwitterionic surfactant is oleamidopropyl betaine,

86. The fluid of claim 73 wherein the amount of zwitterionic surfactant is from about 0.5% to about 6% by weight of the fluid.

87. The fluid of claim 73 wherein the anionic surfactant is present at 0.9% or less by weight of the fluid.

88. The fluid of claim 84 wherein the amount of zwitterionic surfactant is from about 0.5% to about 6% by weight of the fluid.

89. The fluid of claim 85 wherein the anionic surfactant is present at 0.9% or less by weight of the fluid.

90. A viscoelastic fluid comprising:

(1) an aqueous medium;

(2) an amphoteric surfactant; and

(3) a member selected from the group consisting of organic acids, organic acid salts, inorganic salts, and combinations of one or more organic acids or organic acid salts with one or more inorganic salts;

wherein the fluid exhibits the property of viscoelasticity.

91. The fluid as claimed in claim 90 wherein the amount of the surfactant is from about 0.5% to about 10% by weight of the fluid.

esp dihydroxyethyl glycinate  
or alkylamidopropyl betaine

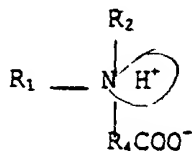
Est. 4  
Est. 4105T. Kallow glycolate (viscous)

SUB  
B9 92. The fluid as claimed in claim 90 wherein the member is an inorganic salt and is present in an amount of from about 0.1% to about 30% by weight.

93. The fluid as claimed in claim 90 wherein the member is an organic acid or salt thereof and is present in an amount of from about 0.1% to about 10% by weight.

94. The fluid of claim 90 wherein the surfactant is represented by formula

(VI):



wherein R<sub>1</sub> represents alkyl, alkenyl, alkylarylalkylene, alkenylarylalkylene, alkylaminoalkylene, alkenylaminoalkylene, alkylamidoalkylene, or alkenylamidoalkylene, wherein each of the alkyl groups have from about 14 to about 24 carbon atoms and may be branched or straight chained and saturated or unsaturated, and wherein the alkylene groups have from about 1 to about 6 carbon atoms,

R<sub>2</sub> is selected from the group of alkyl, alkenyl, arylalkyl, hydroxyalkyl, carboxyalkyl, and hydroxyalkyl polyoxyalkylene, each having from about 1 to about 10 carbon atoms, and

R<sub>4</sub> is a hydrocarbyl radical with chain length of about 1 to about 4.

95. The viscoelastic fluid of claim 90 wherein R<sub>1</sub> represents alkyl having from about 16 to about 22 carbon atoms or RCONHCH<sub>2</sub>CR<sub>2</sub>CH<sub>2</sub>-, wherein R is an alkyl group having from about 16 to about 22 carbon atoms, wherein R<sub>2</sub> and R<sub>3</sub> are, independently, methyl, ethyl, benzyl, hydroxyethyl, hydroxypropyl, carboxymethyl, or carboxyethyl, and wherein R<sub>4</sub> is methylene or ethylene.

96. The fluid of claim 90 wherein the surfactant is selected from among amphoteric imidazoline-derived dipropionates.

97. The fluid of claim 90 wherein the surfactant is disodium tallowiminodipropionate.

98. The fluid of claim 90 wherein the aqueous medium is water, the fluid comprising greater than or equal to about 50% water by weight.

99. The fluid of claim 94 wherein the aqueous medium is water, the fluid comprising greater than or equal to about 50% water by weight.

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